# MSE-Colloquium@NTU

**20 January 2016, 4.00 pm**

**Lecture Theatre 6, Nanyang Technological University**

## Hand-Operating Nanotechnology: Can We Control Molecular Machines By Our Hands? YES WE CAN!


***Professor Katsuhiko Ariga***

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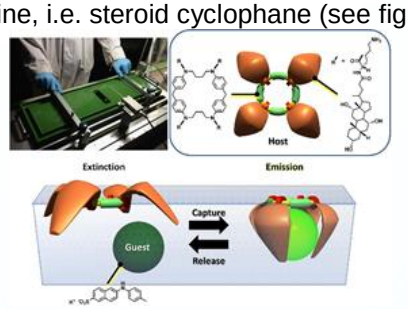
## About the Talk

Functional materials have been wisely constructed via bottom-up approaches, as seen in the preparation of molecular and nano-patterns and complexes, and organized nanostructures. Novel concepts to bridge nano- (molecular) structures and bulk systems now become crucial in order to control real nano- and molecular functions from our visible macroscopic worlds. Here, we propose a novel methodology - “hand-operating nanotechnology”, where molecular orientation, organization and even functions at the nanometer-scale can be operated by macroscopic (hand) operation. This concept can be realized in dynamic two-dimensional mediums, such as thin films at the air-water interface, because this medium possesses both features of bulk and molecular dimensions. For example, we successfully manipulated molecular machines at the air-water interface upon bulk (10-100 cm size) motion of the entire monolayer and realized “capture and release” of aqueous guest molecules using a molecular machine, i.e. steroid cyclophane (see figure below).




In addition, mechanically controlled chiral recognition of amino acids and discrimination of nucleosides by the supramolecular monolayer was successfully demonstrated. The concept has also been applied to the indicator-displacement assay for sensor usage. These examples demonstrate our new concept, which is manual hand-operating nanotechnology, with which we can manually control nano/molecular phenomena and functions by a macroscopic mechanical force, such as hand motion. Using hands for functional operation would be most environmentally friendly and least energy consuming.

## About the Speaker

Professor Katsuhiko Ariga is the Director of Supermolecules Unit and Principal Investigator at the World Premier International (WPI) Research Center and the International Center for Materials Nanoarchitectonics (MANA), and the National Institute for Materials Science (NIMS). He received his B. Eng., M. Eng., and Ph. D. degrees from the Tokyo Institute of Technology (TIT). He was an Assistant Professor at TIT, worked as a postdoctoral fellow at the University of Texas at Austin, USA, and then served as a group leader in the Supermolecules Project at Japan Science and Technology Agency (JST). Thereafter, Professor Ariga worked as an Associate Professor at the Nara Institute of Science and Technology, and then became involved with the ERATO Nanospace Project at JST. In January 2004, he moved to NIMS and was also appointed Professor at several Universities. Professor Ariga has editorial activities for 9 international journals. He has published more than 500 scientific papers, has an H-index of 77 and citation count exceeding 21000.